## Appendix D
# Detailed Action Report

*Detailed Action Report*

# Proposed Improvements to the I-74 Bridge at Moline, IL

## Rock Island County, Illinois

Prepared for

**Illinois Department of Transportation**

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# Detailed Action Report: I-74

## 1.0 Introduction

The Iowa and Illinois Departments of Transportation (Iowa DOT and Illinois DOT) and the Federal Highway Administration are proposing improvements to the Interstate 74 (I-74) corridor in the Quad Cities from 23rd Avenue in Moline, Illinois, north to 53rd Street in Davenport, Iowa. The project traverses the cities of Moline, Bettendorf, and Davenport, and includes a crossing of the Mississippi River. The proposed improvements will consider additional capacity on I-74, an improved Mississippi River crossing, improvements to the existing 11 service interchanges, enhancements to the connecting arterial roadway system, and improved opportunities for transit and intermodal connections.

The purpose of the proposed improvements to the I-74 corridor is to improve mobility, travel reliability, and safety in the I-74 corridor and to enhance economic development opportunities. The northbound I-74 (Illinois to Iowa) bridge across the Mississippi River was opened in 1935, and the southbound I-74 (Iowa to Illinois) bridge was completed in 1960. Figure 1 shows a close-up aerial photograph of the I-74 bridge and environs, and Figure 2 depicts a wide-angle aerial photograph of the project area.

## 2.0 Report Purpose and Legal Context

A Detailed Action Report is necessitated in Illinois when listed species or designated Illinois Natural Areas will likely be impacted in the course of a roadway improvement. See BDE Manual 26-9.06(d), Section 11(b) of the Illinois Endangered Species Protection Act [520 ILCS 10/11] and Section 17 of the Illinois natural Areas Preservation Act [525 ILCS 30/17].

The purpose of the Detailed Action Report is to document how the proposed action will impact listed species or designated Natural Areas. The Agency Action Report (dated June 19, 2001) and subsequent communications document the presence of a designated Natural Area (Mississippi River - Moline Natural Area) and the presence of listed species in and near the corridor are applicable to the I-74 project. By interagency agreement, the Detailed Action Report serves as a proxy for a Biological Assessment. Upon review of the Detailed Action Report, the IDNR will respond with a Biological Opinion which determines the extent to which the proposed project will impact listed species or designated Natural Areas.

## 3.0 Background of Mississippi River - Moline Natural Area

The Mississippi River - Moline Natural Area (The Natural Area) was added to the Illinois Natural Areas Inventory in 1999. This Natural Area is designated as Category II because it contains specific suitable habitat for threatened or endangered species. Portions of what is now the Mississippi River - Moline Natural Area have been designated as a mussel refuge since 1988, i.e. Sylvan Slough.

The Mississippi River - Moline Natural Area extends linearly along the Mississippi River from Lock and Dam 15 to Lock and Dam 14. Lock and Dam 15 is approximately 4 miles downstream from the existing I-74 bridge. Lock and Dam 14 is located approximately 7 miles upstream from the existing I-74 bridge. The Mississippi River - Moline Natural Area excludes land on Arsenal and Campbell Islands.

Listed species known to occur within the Natural Area include several mussel species including the Higgins eye pearly mussel (*Lampsilis higginsi*), the spectacle case (*Cumberlandia monodonta*), the butterfly mussel (*Ellipsaria lineolata*), and the sheepnose mussel (*Plethobasus cyphyus*). The bald eagle (*Haliaeetus leucocephalus*) is also known to use The Natural Area as wintering habitat. Status and basic biology of listed species known from The Natural Area are summarized in Section 4.0.

# 4.0 Status and Biology of Listed-Species

## 4.1 Federally-Listed Species

*Higgins Eye Pearly Mussel (Federally Endangered)*

The Federally Endangered Higgins Eye Pearly Mussel (*Lampsilis higginsi*) is known to occur immediately upstream and downstream from the existing I-74 Bridge over the Mississippi River (Whitney *et al* 1996, Illinois DNR 2001). The mussel bed inhabited by Higgins Eye Pearly Mussel in the vicinity of the I-74 Bridge is known locally as Sylvan Slough, used synonymously in this report as The Mississippi River - Moline INAI. Sylvan Slough, located at River Mile 485.8, lies, in part, underneath the I-74 bridge and slightly on the downstream side. Mussel surveys in Sylvan Slough were undertaken in the 1980's and in 1994 and 1995 (Whitney *et al* 1996). The density of Higgins Eye Pearly mussels found in Sylvan Slough during these survey efforts are estimated to be less than 0.33 live specimens / $m^2$ (Whitney *et al* 1996). Another location of the Higgins Eye Pearly mussel was recorded 2.7 miles upstream from the existing I-74 bridge (Whitney *et al* 1996).

*Spectacle Case (Federal Candidate)*

The Federal Candidate Spectacle Case Mussel (*Cumberlandia monodonta*) is known to occur approximately 0.5 miles upstream from the existing I-74 Bridge at River Mile 486.3 (Illinois DNR 2001). For reference, the existing I-74 Bridge is located at River Mile 485.8. Density of the Spectacle Case Mussel at this location is unknown. An additional location of the Spectacle Case mussel is recorded several miles upstream from the existing I-74 Bridge (Whitney *et al* 1996).

*Bald Eagle (Federally Threatened)*

The Illinois Department of Natural Resources (ILDNR) identified a Bald Eagle (*Haliaeetus leucocephalus*) record at a location (1997 “018”) within the river channel approximately one-quarter mile East (upstream) of the I-74 bridge (See Appendic C). The Bald Eagle is a Federally Threatened species that has been proposed for de-listing. It is also listed as an endangered species in Illinois. The Mississippi River - Moline Natural Area is used as wintering habitat for the Bald Eagle. The use of the Natural Area was first reported in 1986

and the last observations were reported in 1999. During the winter of 1999, a range of approximately 63-108 Bald Eagles were observed to be using habitat within the Mississippi River - Moline Natural Area.

## 4.2 State-Listed Species

Several state-listed mussel species are known from the vicinity of the existing I-74 Bridge; the Spectacle Case, a.k.a the Bullnose (*Cumberlandia monodonta*), the Butterfly Mussel (*Ellipsaria lineolata*), and the Sheepnose (*Plethobasus cyphyus*). Biology, status, and location information for the Spectacle Case mussel, a Federal Candidate species, is covered under Section 4.1 of this report.

*The Butterfly Mussel (State Threatened in Illinois, State Endangered in Iowa)*

The Butterfly Mussel is known to occur at River Mile 485.8 (directly under the existing I-74 Bridge) (Whitney *et al* 1996), River Mile 486.3 (0.5 miles upstream from the existing I-74 Bridge) (Illinois DNR 2001), and at River Mile 488.5 (2.7 miles upstream from the existing I-74 Bridge) (Whitney *et al* 1996).

*The Sheepnose Mussel (State Threatened in Illinois, State Endangered in Iowa)*

The Sheepnose Mussel is known to occur at River Mile 485.8 (directly under the existing I-74 Bridge) (Whitney *et al* 1996), and at River Mile 486.3 (0.5 miles upstream from the existing I-74 Bridge) (Illinois DNR 2001).

# 5.0 Existing and Proposed I-74 Bridge Characteristics

Table 1 summarizes the footprint of each pier on the Illinois side of the Illinois-bound and the Iowa-bound spans of the existing I-74 bridge. The total pier footprint of the existing Illinois-bound span is 10,405 sq. ft. of which 9,205 sq. ft. are within the river channel and the remainder are on islands. The total pier footprint of the existing Iowa-bound span is 8,940 sq. ft. of which 7,740 sq. ft. are within the river channel and the remainder are on islands.

TABLE 1
Summary of bridge pier footprints (sq. Ft.) on existing I-74 Bridge

| Pier Identification | Illinois-bound span | | Iowa-bound span | |
|---|---|---|---|---|
| | On Island? | Footprint Area (sq. f t) | On Island? | Footprint Area (sq. ft) |
| C | N | 1095 | N | 1060 |
| D | N | 1075 | N | 615 |
| Moline Anchorage | N | 3560 | N | 3050 |
| E | N | 1075 | N | 615 |
| F | N | 600 | N | 600 |
| G | N | 600 | N | 600 |

TABLE 1

Summary of bridge pier footprints (sq. Ft.) on existing I-74 Bridge

| Pier Identification | Illinois-bound span | | Iowa-bound span | |
|---|---|---|---|---|
| | On Island? | Footprint Area (sq. f t) | On Island? | Footprint Area (sq. ft) |
| H | Y | 600 | Y | 600 |
| J | Y | 600 | Y | 600 |
| K | N | 600 | N | 600 |
| L | N | 600 | N | 600 |
| | | | | |
| **Total Pier Footprint (sq. Ft.)** | | **10,405** | | **8.940** |
| **Total Pier Footprint (sq. Ft.) in water** | | **9,205** | | **7,740** |

Engineering has not yet been completed to a stage where pier footprint areas can be calculated for the proposed bridges. However, Table 2 provides a reliable estimate of the number of piers required on the Illinois side with respect to the proposed alternative (E1, E2, F1, and F2) and bridge style (Tied Arch, Cable Stayed, and Suspension). The "E" alternatives, i.e. E1 and E2 would have slightly less in-river pier footprint than the 'F" alternative, i.e. F1 and F2, because the E alternatives would have 2 piers on islands whereas the F alternatives would not have any piers on islands. The Tied Arch bridge style would require the greatest number of piers, the Cable Stayed bridge style would require the least number of piers, and the Suspension bridge style would require an intermediate number of piers. Locations of bridge piers for each proposed bridge scenario are not yet known.

TABLE 2

Summary of bridge pier characteristics with respect to proposed alternative and bridge style

| Proposed alternative | Bridge style (main span) | Total piers required on Illinois side | Total piers on islands |
|---|---|---|---|
| E1 | Tied Arch | 25 | 2 |
| | Cable Stayed | 19 | 2 |
| | Suspension | 22 | 2 |
| E2 | Tied Arch | 25 | 2 |
| | Cable Stayed | 19 | 2 |
| | Suspension | 22 | 2 |
| F1 | Tied Arch | 25 | 0 |
| | Cable Stayed | 19 | 0 |
| | Suspension | 22 | 0 |
| F2 | Tied Arch | 25 | 0 |
| | Cable Stayed | 19 | 0 |
| | Suspension | 22 | 0 |

A discussion of existing and proposed bridge deck surface area is relevant to the amount of bridge deck runoff and associated constituents entering the Mississippi River. The bridge deck surface (including approaches) for all proposed alternatives would be approximately twice that of the existing bridge spans. The amount of automobile-related constituents entering the River is a function of how quickly traffic can move across the bridge. The addition of an extra lane in either direction of travel will allow traffic to travel more quickly across the bridge which will in turn serve to lessen the effects of automobile-related runoff.

All proposed bridge alternatives are located upstream from the existing bridge. On the Illinois side of the Mississippi River, proposed alternatives F1 and F2 are located several hundred feet upstream from proposed alternatives E1 and E2. Figure 1 shows that a portion of the Mississippi - Moline INAI extends upstream from all proposed alternatives.

# 6.0 Potential Impacts to Listed Species / Natural Area

## 6.1 Potential Impacts to Listed Species

Similar bridge replacement projects have shown that proper use of Best Management Practices (BMPs) (See Section 7.2) and well-planned mussel relocation (See Section 7.3) can effectively reduce impacts to mussels to negligible levels.

Impacts that may occur to mussels during bridge replacement may result from the new bridge pier footprint, old bridge pier demolition, siltation downstream from in-stream work, or bridge deck runoff of de-icing chemicals and other polluting constituents.

## 6.2 Potential Impacts to the Mississippi River - Moline INAI

Impacts to the Mississippi River - Moline INAI are mostly synonymous with potential impacts to the mussel fauna (listed and non-listed) for which the INAI provides refuge. Footprint impacts to the INAI would be the net increase in pier footprint of the proposed bridges compared to the existing bridge.

# 7.0 Project Sequencing: Avoidance, Minimization, Mitigation

## 7.1 Impact Avoidance

The urbanized nature of the I-74 project area presents constraints that preclude complete avoidance of impacts to the Mississippi River - Moline Natural Area. Impacts to listed-mussel species known to occur in and near the Natural Area would be avoided to the extent practicable and mitigated by relocating them to nearby suitable habitat prior to commencement of bridge construction.

## 7.2 Impact Minimization

Several proven techniques and Best Management Practices (BMPs) can be incorporated into bridge demolition, construction, and maintenance plans in order to minimize impacts in ecologically sensitive areas. Key methods are described below:

**Silt curtains**. Silt curtains are a means of settling sediment created from in-stream work from the water column using impermeable geotextiles. The upper edge of the silt curtain is buoyant as a result of flotation material. The lower edge of the silt curtain is weighted. Silt curtain function most efficiently where they remain permanently closed throughout the duration of in-stream work. Silt curtains can be used to minimize water quality impacts of pier work; however, silt curtains function best in an environment where water currents are less than 1-2 knot (1.7 - 3.4 feet/second).

**Gunderbooms**. Gunderbooms are simiar to silt curtain, though they are constructed out of permeable geotextiles designed for filtration. Thus, with gunderbooms, some water ins allowed to flow through while sediment is not. Like silt curtains, gunderbooms are buoyant along their top edge and weighted along their bottom edge.

**Coffer dams**. Coffer dams of sheet pilings are commonly used for bridge pier construction. Coffer dams are effective to prevent suspended sediments from entering the river.

**Low-impact pier removal**. Expansive materials for pier demolition have been used on several environmentally sensitive bridge replacements. The process involves drilling a network of holes in each pier to be demolished and filling the holes with a slurry that expands upon hardening. With this method, bridge piers are reduced to rubble in a matter of hours or days. BRISTAR ™ is a product that has been used successfully by several state departments of transportation for low-impact pier demolition [1]. Low impact methods, as described above, are desirable for the following reasons; BRISTAR™ is non-toxic, it works quickly and efficiently, eliminates risk of blasting-related fly-rock in an urban setting, eliminates blasting concussion likely damaging to federally and state listed mussel species. More information on BRISTAR™ is available on the following webpages:

http://www.demolitiontechnologies.com/about.html

http://www.demolitiontechnologies.com/general-concept.html

**Alternative de-icing chemicals**. Several state DOTs have tried alternatives to sodium chloride for use as road de-icers. Several chemicals melt road ice efficiently while reducing the deleterious effects of sodium chloride run-off.

**Work windows.** Mussel relocations can be successful if completed when air temperatures are moderate, e.g. in late Spring or early Fall.

## 7.3 Mitigation

Mussel relocation is a viable means of mitigation for potential impacts to mussel species. Generally, the success of a mussel relocation effort is measured in terms of mussel mortality rate. Key factors known to affect mussel mortality are as follows:

- **Habitat change**. Microhabitat characteristics present in the native mussel bed should be similar in the relocated bed area. Suitable substrate is generally sand,

[1] The of product-specific names in this report is not intended as an endorsement for the product.

gravel, and some rock. A substrate with excessive fines such as silt is not appropriate as a relocation bed. The mussel fauna observed at the relocation bed should be quite similar to the mussel fauna collected at the impact area.

- **Water temperature**. All mussel relocations should be conducted while the water temperature is >16° Celsius. Water temperature in the native mussel bed, the transportation containers, and the relocation bed should be the same so as to avoid sudden temperature changes which stress mussels and contribute to higher mortality rates.

- **Air temperature**. Relocations should be avoided on hot days (>35°C) and cold days (<0°C) because it tends to stress the mussels and contributes to higher mortality rates.

Successful mussel relocation efforts are summarized in Section 7.3.1 of this report. Unsuccessful mussel relocation efforts are summarized in Section 7.3.2 of this report.

### 7.3.1 Historical Successful Mussel Relocations

Several mussel bed relocation efforts have been successful as mitigation for federally and state-listed mussels potentially impacted by roadway improvements (MnDOT 1996; Dunn 1993; ESI 1995; Harris 1984, 1986, 1989; Harris *et al*, 1992; Jenkinson 1985,1989; ESI 1999; and Oblad 1979).

**Sylvan Slough - Moline, Illinois**. (Oblad 1979)

In preparation for replacement of the Moline Bridge from Moline, IL to Arsenal Island, mussels were relocated (Oblad 1979). Rare mussels were relocated to a point directly under the existing I-74 Bridge between the Moline, IL riverbank and the small island near the Moline, IL riverbank (Oblad 1979). See Figure 1 for location of the Moline Bridge in relation to the existing I-74 Bridge.

The river bottom surrounding two proposed bridge piers was cleared of mussels. The area that was cleared of mussels for each pier was equal to the footprint of the proposed cofferdam plus 10 feet out from each cofferdam edge. The cleared area for each pier was 40 feet by 70 feet, i.e. 2,800 square feet. A total of 4,334 mussel specimens were removed from the cleared area at pier 12 and 2,762 mussel specimens were removed from the cleared area at pier 11.

Re-capture experiments of marked and relocated mussels occurred approximately one year after the relocation effort. Mortality rates were estimated to be low for Higgins Eye Pearly Mussel (*Lampsilis higginsi*), other rare mussel species, and for common mussel species.

**Stillwater Bridge, Minnesota**. (MnDOT 1999)

In preparation for the replacement of the existing Stillwater, MN Lift Bridge over the St. Croix River, mussels were relocated (MnDOT 1999). The replacement bridge, the proposed Trunk Highway 36 Bridge, is approximately 1,500 meters (4,900 feet) downstream from the existing bridge. The Federally Endangered Higgins Eye Pearly Mussel (*Lampsilis higginsi*)

and several more common species were relocated to a stretch of the St. Croix River that lies between the existing and proposed bridges (MnDOT 1999).

In total 18,061 mussel specimens were removed from a total area of 43,055 square feet (4,000 square meters). In total, 25 mussel species including the Higgins Eye Pearly Mussel (*Lampsilis higginsi*) were relocated (MnDOT 1999).

Re-capture experiments of marked and relocated mussels occurred one and two years after the relocation effort. Mortality rates were estimated to be quite low for all relocated mussel species in both years, ranging from 3% to 6.2%. Mortality rates observed in this effort are thought to be similar to the natural mortality rate of mussels in the lower St. Croix River (MnDOT 1999).

### 7.3.2 Historical Unsuccessful Mussel Relocations

Several relocation efforts have been unsuccessful as judged by high mortality rates of relocated mussels (Burke 1991, Cope and Waller 1995). See MnDOT (1999) for a summary of other mussel relocation efforts, successful and unsuccessful.

**Prescott Bridge, Wisconsin.** (Burke 1991)

Mussels were relocated in preparation for a new bridge over the St. Croix River at Prescott, Wisconsin. The Higgins Eye Pearly Mussel (*Lampsilis higginsi*) was among the relocated mussel species. Re-capture of marked relocated mussels revealed a mortality rate of 88%. A key factor contributing to the high mortality rate is improper ambient temperatures during mussel transport to the relocation site.

# 8.0 Results of Consultation with Illinois DNR

IDOT submitted a request for an Agency Action Report concerning proposed improvements to I-74 to the IDNR on June 19, 2001. The IDNR responded by informing the IDOT that occurrences of one federally endangered mussel species, the Higgins eye pearly mussel (*Lampsilis higginsi*), several state-listed mussel species, and the Bald Eagle were known from the vicinity of the existing I-74 bridge. It was learned by IDOT at a later date that the I-74 Bridge currently bisects the Mississippi River - Moline INAI Site.

The IDOT requests that, contingent upon an approved detailed mussel relocation plan, informal Section 7 consultation be closed with respect to the proposed I-74 bridge improvements and potential impacts to the Federally Endangered Higgins eye pearly mussel (*Lampsilis higginsi*).

# 9.0 List of References

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# Figures

FIGURE 1
Close-up aerial photograph of I-74 bridge crossing

FIGURE 2
Aerial photograph depicting the I-74 bridge crossing area and the boundaries of the Mississippi River - Moline INAI